WASINIEWSKA, Weronika, BARAŃSKI, Marcin, KANDEFER, Tomasz, SROKA, Maria Izabela, KOSEK, Szymon, KLONOWSKA, Justyna and WALKOWSKI, Radosław Jan. Nasal Foreign Bodies in Children: A Literature Review. Quality in Sport. 2025;44:62971. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.44.62971
https://apcz.umk.pl/QS/article/view/62971

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 l.p. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).
The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 26.06.2025. Revised: 21.07.2025. Accepted: 06.08.2025. Published: 10.08.2025.

Nasal Foreign Bodies in Children: A Literature Review

AUTHORS:

Weronika Wasiniewska, e-mail: wasiwer@gmail.com, tel: 783787695
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0001-9263-5710

Marcin Barański, e-mail: baranskimarcin23@gmail.com tel: 794613298
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0003-7792-5837

Tomasz Kandefer, e-mail: tomekkandefer92@gmail.com tel: 787631088
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0004-2714-8344

Maria Izabela Sroka, e-mail: marsrokaa@gmail.com, tel. 513896026
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0002-8743-8963

Szymon Kosek, e-mail: kosek.med@gmail.com, tel: 668327403
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0001-7350-2306

Justyna Klonowska, e-mail: justynajklonowska@gmail.com, tel: 505110107
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0002-8170-9187

Radosław Jan Walkowski, e-mail radwalk.med@gmail.com tel: 728730725
Medical University of Warsaw, Żwirki I Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0006-9933-6437

ABSTRACT:

Nasal foreign bodies (NFBs) are a common pediatric emergency, particularly in children aged 2–4 years, driven by exploratory behavior and inadequate supervision. These objects, ranging from beads to button batteries, can cause symptoms such as nasal discharge, obstruction, and epistaxis. Complications include chronic sinusitis, rhinolith formation, and tissue necrosis, with button batteries posing significant risks due to chemical burns. Diagnosis relies on clinical examination and imaging when necessary. Management involves techniques like positive pressure or endoscopic removal, with general anesthesia for complex cases. This review aimed to collect, systematize, and summarize the available knowledge on NFBs in children by utilizing systematic reviews, meta-analyses, and clinical studies. Preventive strategies emphasize caregiver education, safe storage practices, and product redesign to reduce risks and improve outcomes.

KEYWORDS:

- Nasal foreign bodies
- Pediatric emergencies
- Button batteries
- Rhinolith formation
- Endoscopic removal
- Preventive strategies

INTRODUCTION:

Nasal foreign bodies (NFBs) constitute a prevalent pediatric otolaryngological emergency, predominantly affecting children aged 2-4 years [1,2]. This age group's innate curiosity, coupled with improved dexterity and environmental exploration, drives the insertion of small objects into bodily orifices. Lack of parental supervision and inadequate childproofing of small items contribute significantly to NFB incidents, which account for nearly 30% of upper aerodigestive tract foreign body cases in emergency settings [3,4].

The spectrum of aspirated objects includes inorganic materials such as plastic beads, button batteries, and toy fragments, alongside organic substances like food particles and seeds [5,6]. Clinical presentation often involves unilateral nasal obstruction, purulent or bloody rhinorrhea, and localized pain, though asymptomatic cases occasionally delay diagnosis [7]. Prolonged retention risks complications such as sinusitis, mucosal necrosis, and septal perforation, with button batteries posing acute threats due to alkaline leakage and tissue liquefaction [8,9].

Timely intervention is critical to mitigate morbidity. Most NFBs are managed in outpatient settings using techniques like positive pressure ventilation, forceps extraction, or balloon catheter retrieval, achieving success rates exceeding 81,47% [10,11]. Challenges arise in uncooperative children or cases involving posteriorly displaced objects, necessitating procedural sedation or general anesthesia [10]. Recent advancements in pediatric endoscopic tools and imaging modalities have enhanced diagnostic accuracy and retrieval precision [12]. Concurrently, public health campaigns emphasizing caregiver education and household safety modifications aim to reduce incidence rates [12].

This review synthesizes current evidence on NFB epidemiology, diagnostic approaches, management algorithms, and preventive strategies, underscoring the importance of early recognition and removal of NFBs, which are crucial to prevent complications.

EPIDEMIOLOGY

Nasal foreign bodies (NFBs) represent a common yet underrecognized pediatric emergency, with distinct epidemiological patterns shaped by developmental, environmental, and socioeconomic factors. Globally, NFBs account for 30% of all foreign bodies in otolaryngological cases [13], peaking among children aged 1–5 years, particularly between 2–3 years [1,11,14] This age group is characterized by exploratory behavior, fine motor skill development, and oral fixation, which drive the insertion of small objects into nasal cavities during play [4,10]. Children under five years of age are especially susceptible due to their natural curiosity and inclination to explore accessible body openings [15]. Mumtaz Ahmad Umar's study indicates a female predominance, with a female-to-male ratio of 1.26:1, consistent with findings from other studies [16,17]. However, some studies have reported a male predominance [18]. Moreover, certain groups are at higher risk for nasal foreign bodies. Tobias Schuldt's study suggests a potential association between self-insertion of foreign bodies and ADHD, psychological development or congenital malformation [19].

The incidence and nature of nasal foreign bodies in pediatric populations demonstrate significant associations with cultural practices, socioeconomic conditions, and demographic factors across different regions. M. Dadá's recent research highlights that ear, nose, and throat foreign body incidents occur with greater frequency in economically disadvantaged nations, partly due to children's limited access to age-appropriate playthings [20]. This economic disparity fundamentally shapes both how often nasal foreign body incidents occur and what types of objects children insert. In communities with financial constraints, household items frequently replace commercial toys, escalating the risk of foreign body insertion. Cultural elements exert considerable influence as well, as shown in the Nigerian study where beads constituted 34.9% of nasal foreign bodies, reflecting their importance in Nigerian societies where they serve ceremonial and spiritual functions [21]. The connection between geographic location, living environment, and nasal foreign bodies becomes evident when examining cases involving living organisms such as insects, larvae, and worms, which predominantly appear in tropical environments with substandard sanitation [22]. These cases disproportionately affect children from economically disadvantaged backgrounds with limited access to proper hygiene

facilities, especially those experiencing homelessness or residing in impoverished urban settlements [22]. This complex interrelationship between cultural traditions, economic status, and environmental conditions creates distinctive patterns of nasal foreign body presentations that necessitate prevention strategies tailored to specific cultural contexts and social circumstances.

The types of foreign bodies found in pediatric nasal cavities are highly varied. Inorganic objects, such as beads, paper fragments, toy parts, and batteries, accounted for the majority of cases, while organic materials, including nuts and fruit seeds, were less commonly observed [4,6,23,24]. Beads, small plastic toys, and food items like seeds and nuts emerged as the most frequently retrieved nasal foreign bodies overall [7,13]. According to the study by Hahn Jin Jung et al., inorganic materials made up 73.3% of nasal foreign bodies in children [1]. Beads were the most common type across all age groups, except in children aged 1–3 years, where beans and corn were identified as the predominant foreign bodies [1].

Several studies indicate that the majority of nasal foreign bodies in children are located in the anterior nasal cavity, particularly between the inferior nasal concha and the septum [1,7,18,25]. A notable right-sided dominance has also been observed, which is often attributed to children using their dominant hand to insert objects into their nostrils, resulting in a higher prevalence of foreign bodies in easily accessible areas such as the inferior turbinate and septal region [1,23,26]. However, one study challenges this assumption, suggesting that right-handedness in children may not necessarily influence the right nostril being the most common site for NFBs [23].

SYMPTOMS

NFBs in children present with a spectrum of clinical manifestations that vary based on the type, location, and duration of the foreign body. The most common clinical presentation is unilateral foul-smelling nasal discharge, observed in approximately 53.77% of cases [22,4,27]. Additional symptoms include nasal obstruction, nasal mucosal irritation, congestion, and swollen nasal mucosa [4]. Children may experience pain and discomfort in the nasal cavity, and occasionally present with epistaxis [22]. A significant proportion of children (82%) remain asymptomatic at presentation, particularly when foreign bodies are inert or recently inserted [28]. Although caregivers observe the insertion in 40–80% of cases, a significant number of incidents occur without supervision, resulting in delayed detection [4,24]. In

unwitnessed incidents, detection can occur through the child's voluntary disclosure or parental identification during bathing or standard caregiving activities. In some cases, NFBs are identified incidentally during evaluation of unilateral rhinorrhea, nasal obstruction, fetid discharge, or nasal discomfort resulting in mouth breathing [4,7]. Research shows that the majority of cases (89.4%) come to medical attention due to three main factors: the child's nasal discomfort, the child's own report of inserting an object, or caregiver discovery. Notably, 85.0% of foreign bodies are identified within 24 hours of insertion [7].

The symptomatology varies significantly based on the type of foreign body. Organic materials like food, seeds, and vegetables, which constitute 30.81-55.8% of cases, are more likely to absorb moisture, swell, and trigger robust inflammatory responses [16]. In contrast, inorganic objects (44.2-66.3% of cases) such as beads, foam, plastic, and metal objects generally cause less severe symptoms unless they have sharp edges or chemical properties [4].

Button batteries represent a particularly concerning type of NFB, causing electrical and chemical burns to nasal tissue [29]. A study of 176 cases found septal perforation in 17.61% of patients with button battery foreign bodies [10]. These batteries initiate tissue damage within minutes of insertion through three mechanisms: mechanical pressure, chemical components, and electrical currents [9]. Complications include septal perforation, tissue necrosis, nasal adhesions, bleeding, infection, and saddle nose deformity, with severity correlating to duration of impaction [9,10,29].

Long-term retention of NFBs can result in chronic sinusitis, nasal polyps, fungal infections, and deviated nasal septum [30]. A remarkable case study documented a nasal foreign body retained for over 10 years, identified as packing material that had calcified into areas with bone-like density [31]. The patient presented with nasal congestion and purulent discharge, with the foreign body only discovered during CT imaging [31]. Another potential serious complication is rhinolith formation, where mineral salts deposit around the foreign body, potentially causing erosion into the nasal septum and soft palate [1,22].

In rare cases, nasal myiasis (maggot infestation) may occur, causing atrophic rhinitis, suppuration and destruction of nasal mucosa with necrosis of turbinates and septal cartilage [22,32]. These maggots may extend into paranasal sinuses and orbit, leading to potential neurological complications [22,32]. Furthermore, every nasal foreign body presents an aspiration risk, particularly those located at the posterior part of the nasal cavity, which can cause acute airway obstruction if dislodged posteriorly during removal attempts [33,34].

DIAGNOSTIC APPROACH AND DIFFERENTIAL DIAGNOSIS

The diagnosis of NFBs is based on clinical suspicion, history-taking, and physical examination, often revealing unilateral nasal symptoms discussed previously. Physical examination using an LED headlamp combined with anterior rhinoscopy remains the cornerstone of diagnosis, enabling direct visualization of the foreign body in most cases [10]. However, challenges arise when objects are lodged posteriorly or embedded in edematous mucosa, necessitating adjunctive methods such as rigid or flexible fiberoptic endoscopy or imaging [10,35].

Most objects lodged in the nasal cavity are not visible on standard imaging techniques, such as X-rays [36]. As a result, imaging is typically unnecessary when the object can be clearly identified during a physical examination and there is no indication that it might be a button battery or magnet [37]. However, if there is suspicion of a button battery or magnet being present, imaging can be helpful to confirm their location. Additionally, imaging may be warranted if the type of object cannot be determined during the examination or if symptoms such as heavy nosebleeds, dark-colored nasal discharge, facial pain, or swelling are observed [6,37]. In some cases, unexpected objects - whether visible on X-rays or coated with calcium deposits - may be discovered incidentally during imaging performed for other conditions, such as sinus infections or inflammation around the eyes [4,38]. Radiographs, though less detailed, remain useful for initial screening of radiopaque objects and to rule out aspiration in cases with ambiguous histories [39,40].

Various imaging techniques are recommended depending on the location and nature of NFBs. Ultrasound is the preferred option for detecting superficial NFBs within soft tissues, while computed tomography (CT) is more suitable for identifying deeper foreign bodies or those located behind bones due to its high sensitivity and reduced radiation exposure. Magnetic resonance imaging is particularly useful for visualizing low-opacity materials, such as wood, but it is not recommended for ferromagnetic metals because of the risk of displacement and potential harm to the patient. Among all imaging modalities, CT offers the greatest sensitivity and plays a vital role in emergency settings by enabling quick and accurate diagnosis to facilitate timely treatment planning [36].

The differential diagnosis for NFBs encompasses a spectrum of conditions that mimic their presentation. Unilateral rhinorrhea or obstruction may signal antrochoanal polyps, which often arise from the maxillary sinus and extend into the nasopharynx, appearing as soft-tissue masses on imaging [41]. These polyps are typically associated with chronic sinusitis and may require endoscopic evaluation for differentiation [41]. Chronic symptoms that are atypical for nasal foreign bodies can obscure the diagnosis of rhinoliths, which are calcified masses that form around retained foreign objects. As a result, their detection is often incidental during imaging or evaluation performed for unrelated conditions [38].

Allergic rhinitis, though typically bilateral, may manifest unilaterally in children with anatomical variants or concurrent mucosal edema, potentially confounding diagnosis. Moreover E. Ö. Kaçer's study suggests that type 1 hypersensitivity may increase the likelihood of nasal foreign bodies, highlighting the importance of assessing allergy history in such cases [42]. Conversely, adenoid hypertrophy and sinusitis frequently present with bilateral symptoms but can mimic NFBs if asymmetry exists due to secondary infection or obstruction [4,22]. Tumors, though rare in children, must be considered in cases of refractory symptoms or atypical imaging findings.

MANAGEMENT METHODS

Management of NFBs in children requires a multifaceted approach tailored to the type, location, and complexity of the foreign object, as well as the child's age and cooperation level. The literature emphasizes the importance of prompt and careful planning to minimize complications and maximize the likelihood of successful removal on the first attempt. Effective management begins with a thorough clinical assessment. Visualization of the foreign body is crucial, often aided by tools such as nasal speculums or endoscopes. Pharmacological vasoconstriction using agents like oxymetazoline or phenylephrine can reduce mucosal swelling, facilitating both examination and removal [25]. In cases where visualization is challenging, nasal endoscopy provides enhanced access to posteriorly located objects [10,35]. Emergency airway supplies should be readily available, particularly when there is a risk of aspiration during manipulation [33,34].[SEP]Various techniques are employed depending on the characteristics of the NFB. For most inanimate objects, simple instruments such as cupped forceps, hemostats, or curved hooks are effective [43]. Rounded objects, however, present unique challenges due to their smooth surfaces. A curved hook can be passed behind the

object to draw it forward [44,45]. Suction devices are also useful for round or friable materials like plastic or vegetable matter, which may fragment during extraction [46]. Button batteries require urgent removal due to their potential for tissue damage from electrical discharge and chemical leakage. Specialized hooks' smooth, elastic design allows forceful use with minimal risk of tissue damage or bleeding [10].

For cooperative children, positive pressure techniques such as forced exhalation through the nose or "parent's kiss" (a mouth-to-mouth technique) have shown success in dislodging small objects [43,47]. When these methods fail or if the child is uncooperative, general anesthesia—required in 4,5 to 13% of cases—may be necessary for safe removal [10,24,28]. In rare cases where an object is embedded subcutaneously or in the dorsum of the nose, surgical approaches like external rhinoplasty may be required. This method offers better cosmetic outcomes compared to direct incisions over the foreign body [25,48]. In cases involving animate foreign bodies such as larvae or worms, instillation of agents like chloroform solution is often necessary to kill live organisms before mechanical removal. Subsequent treatment with antiparasitic medications ensures eradication of underlying infestations that may lead to recurrence [22,49].

Following successful removal, careful inspection of both nasal cavities and other body orifices is essential to rule out additional foreign bodies. Additionally, nasal bleeding, a common occurrence during NFB removal, should be managed effectively.

COMPLICATIONS AND PREVENTIVE STRATEGIES

NFBs in children are associated with a spectrum of complications, ranging from acute mucosal injury to chronic structural damage. Among the most threatening are button batteries, which can lead to significant complications due to their corrosive and electrical properties. The primary complications include mucosal damage, epistaxis, nasal adhesions, and septal perforations [10]. Studies have reported that septal perforations occur in 17,61% of cases, with the risk influenced by factors such as the duration of impaction, battery charge, and location within the nasal cavity [10,24].

Prolonged retention of inorganic materials in the nasal cavity can trigger chronic inflammation and mineral deposition, leading to rhinolith formation. These calcified masses can cause persistent nasal obstruction, foul-smelling discharge, and recurrent infections [38]. Due to their firm adherence to surrounding tissues, rhinoliths often require surgical

intervention, underscoring the importance of early foreign body removal to prevent such sequelae [1,22,38].

Though rare, nasal myiasis represents a serious complication, particularly in critically ill or immunocompromised patients. If larvae migrate toward adjacent structures, significant complications may result, including palatal perforation and intracranial extension [22,32,49]. Prompt removal under endoscopic guidance and appropriate antimicrobial therapy are essential to prevent disease progression [50].

Complications during foreign body removal are common and can arise from improper techniques or uncooperative patients. Epistaxis is the most frequent immediate complication following removal attempts [4,14,24]. Other issues include mucosal abrasions, posterior displacement of the foreign body into the airway (risking aspiration), and trauma to surrounding structures [33,34]. Multiple failed attempts not only increase patient distress but may necessitate general anesthesia for successful extraction. The use of non-specialized tools like forceps or hooks often exacerbates these risks [51].

Rare but severe outcomes like meningitis or orbital cellulitis may arise if infections spread beyond the nasal cavity [4].

Effective prevention hinges on multifaceted approaches targeting caregivers, manufacturers, and healthcare systems. Parents and caregivers play a crucial role in prevention. Educational campaigns should emphasize the dangers of small objects and encourage safe storage practices. Button batteries, for instance, account for 1.16% of nasal foreign bodies but can lead to severe complications [9,10]. Similarly, small toys and food items like nuts or seeds pose choking and obstruction risks. Parents should ensure these items are kept out of reach of young children and supervise them during playtime and meals. Product redesign, such as child-resistant battery compartments or non-toxic coatings, may mitigate corrosion-related injuries.

In clinical settings, standardized protocols for NFB removal, including the use of purpose-designed tools like balloon catheters, improve success rates and minimize trauma [52]. The "parent’s kiss" technique, achieving 64.5% efficacy, offers a non-invasive first-line option before instrumentation [43,47]. For high-risk cases, such as button batteries or sharp objects, immediate referral to otolaryngology ensures access to endoscopic-guided extraction under general anesthesia, reducing the need for multiple attempts. Public health policies mandating safety warnings on battery packaging and funding community awareness programs are critical to curbing incidence [10]. Together, these strategies address both acute management and long-

term prevention, aiming to reduce the physical and psychological burden of nasal foreign bodies in pediatric populations.

CONCLUSION

NFBs represent a common pediatric emergency, particularly in children aged 2–4 years, driven by their exploratory behavior and fine motor skill development. While most cases involve benign objects like beads or seeds, certain foreign bodies, such as button batteries, pose severe risks due to their chemical and electrical properties. Clinical presentation varies from asymptomatic cases to symptoms like foul-smelling discharge, nasal obstruction, and epistaxis. Timely diagnosis through physical examination and imaging is crucial to prevent complications like chronic sinusitis, rhinolith formation, or tissue necrosis. Effective management includes techniques such as forceps extraction, positive pressure methods, and endoscopic-guided removal, with general anesthesia reserved for complex cases.

Complications during removal, including mucosal injury and aspiration risks, highlight the importance of proper tools and techniques. Preventive strategies emphasize caregiver education, safe storage practices for hazardous items, and product redesigns to minimize risks. Public health campaigns and standardized clinical protocols further enhance safety and management outcomes. By integrating prevention with prompt intervention, healthcare systems can reduce the incidence and complications of NFBs in children, ensuring better long-term outcomes for affected populations.

DISCLOSURE

Author's contribution

Conceptualization: Weronika Wasiniewska; Methodology: Marcin Barański; Check: Weronika Wasiniewska; Formal analysis: Justyna Klonowska; Investigation: Maria Izabela Sroka; Resources: Tomasz Kandefer; Data curation: Szymon Kosek; Writing - rough preparation: Marcin Barański; Writing - review and editing: Justyna Klonowska; Visualization: Maria Izabela Sroka; Supervision: Weronika Wasiniewska; Project administration: Tomasz Kandefer; Receiving funding: no specific funding.

All authors have read and agreed with the published version of the manuscript.

Financing statement

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflict of interest

The authors deny any conflict of interest.

Declaration of the use of generative AI and AI-assisted technologies in the writing process.

In preparing this work, the authors used Perplexity AI for the purpose of checking language accuracy. After using this tool, the authors have reviewed and edited the content as needed and accept full responsibility for the substantive content of the publication.

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